Tutorial-6 DAA

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Q1 **Minimum spanning tree :-**

» also called as minimum weight spanning tree is a subset of edges of a connected to edge-weighted undirected graph that connected all the vertices together, without any cycles and with the min. possible total edge weight.

Applications :-

- Suppose you meant to construct highways or railroads spanning several cities then we can use the concept of min. spanning tree.
- Design LAN.
- Laying pipelines connecting offshore drilling sites, refineries and consume market.

Q2

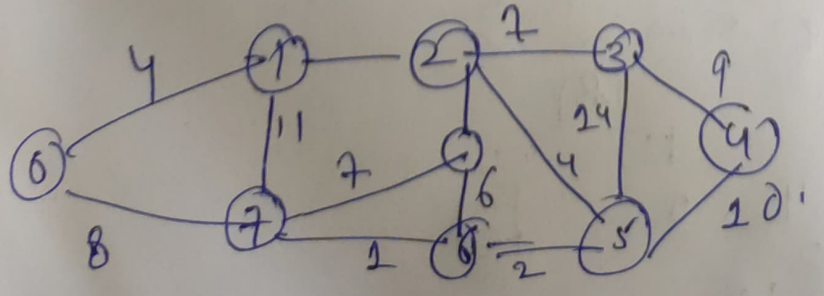
Prim's Algorithm : TC → O((V+E)log)
SC → O(V)

Kruskal : TC → O(|E|log|V|)
SC → O(|V|)

~~Dijkstra~~ : TC → O(V^2)
SC → O(V^2)

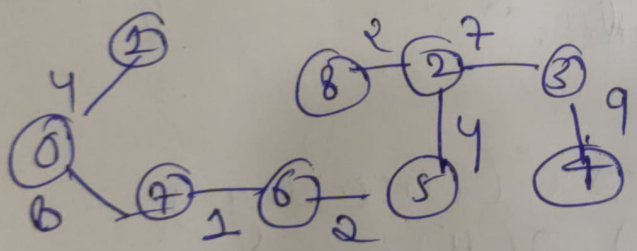
Bellman-ford : TC → O(VE)
SC → O(E)

Q3



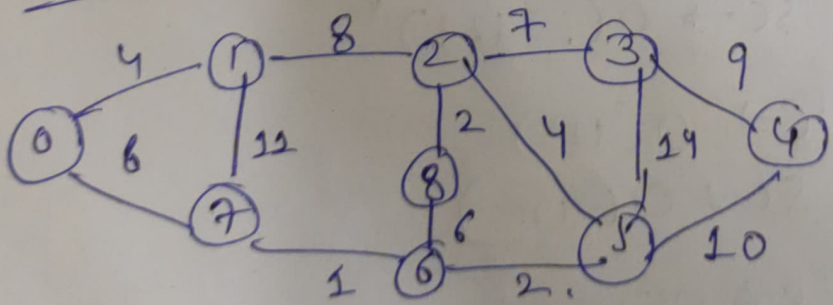
Kruskal's Algo:-

0	v	w	
6	7	1	✓
5	6	2	✓
2	8	2	✓
0	1	4	✓
2	5	4	✓
6	8	6	✗
2	3	7	✓
7	8	7	✗
0	7	8	✓
1	2	8	✗
4	3	9	✓
4	5	10	✗
1	7	11	✗
3	5	14	✗



Weight = 1+2+2+2+4+4+7+8+9 = 37

Prim's Algo:-

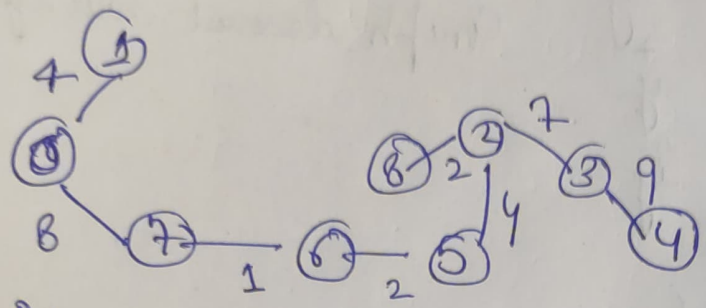


Weight :-

0	1	2	3	4	5	6	7	8
[0]	∞	∞	∞	∞	∞	∞	∞	∞
	4						[8]	
		8				[1]		7
	11	7		4		1		[2]
		7		2				6
	4	[4]		1		10		

Parent :-

0	1	2	3	4	5	6	7	8
-1	6	1	-1	-1	-1	1	1	-1



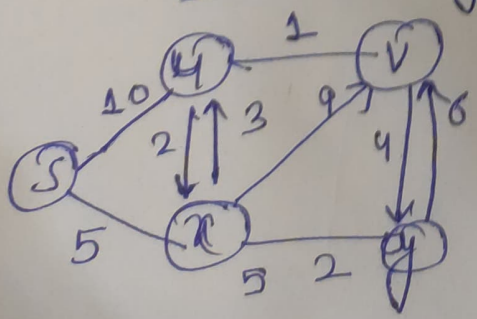
Ans 4 (i)

→ The shortest path may changes. The reason is there may be diff. no. of edges in different paths from s to t.

For Ex :- Let shortest path be of weight 15 and has edge s. Let there be another path with 2 edges & total weight 25. The weight of the shortest path is increased by 5*10 and becomes 15+50. Weight of the other path is increased by 2*10 and becomes 25+20 so the shortest path changes to the other path with weight as 45.

(ii) If we multiply all edges weight by 10, the shortest path don't change. The reason is simple, weight of all path from s to t, get multiplied by the same amount. The no. of edges on a path don't matter, Its is like changing units of weight.

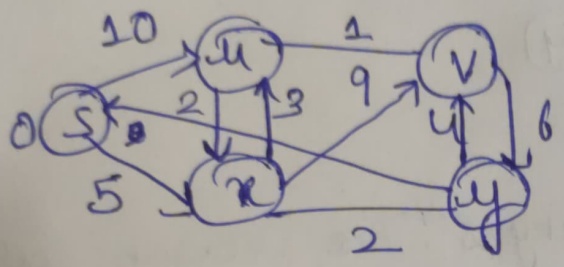
Ans 5 Dijkstra Algo :-



node	shortest dist from s node
u	8
x	5
v	9
y	7

Bellman ford Algorithm:-

	s	u	v	x	y
1st →	0	10	∞	5	∞
2nd →	0	10	11.1	5	∞
		u	v	x	y
3rd →	0	8	9	5	7
		u	v	x	y
4th →	0	8	9	5	7
		u	v	x	y



Graph doesnot have cycle.